



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/866,576	05/29/2001	Tadahiro Ohmi	P 281355 EL01019CDC	4482

909 7590 08/28/2003
PILLSBURY WINTHROP, LLP
P.O. BOX 10500
MCLEAN, VA 22102

EXAMINER

OWENS, DOUGLAS W

ART UNIT PAPER NUMBER

2811

DATE MAILED: 08/28/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/866,576

Applicant(s)

OHMI ET AL.

Examiner

Douglas W Owens

Art Unit

2811

-- The MAILING DATE of this communication appears on the cover sheet with the corresponding address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 30 June 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-8 and 40-47 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-8 and 40-47 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ 6) ☐ Other: _____

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on June 30, 2003 has been entered.

Claim Objections

2. Claims 45 – 47 are objected to because of the following informalities: There is no antecedent basis for the term, "said crystal surface" in the claims. Appropriate correction is required.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 1-5, 7, 8 and 40 – 44, 46 and 47 are rejected under 35 U.S.C. 103(a) as being unpatentable over US patent No. Ahn et al. in view of Campbell, The Science and Engineering of Microelectronic Fabrication, pages 29-31.

Regarding claim 1, 3, 40 and 42 Ahn et al. teaches a semiconductor device (Fig. 3) characterized by:

Art Unit: 2811

a silicon substrate (12);

a silicon oxide film (14) containing krypton (Col. 3, lines 10 – 16).

Ahn et al. does not explicitly teach that the silicon oxide film is substantially defect free. The method of forming the silicon oxide film would have inherently resulted in a substantially defect-free silicon oxide film, since it is the same as the method disclosed in the instant application.

Ahn et al. does not explicitly teach that the silicon oxide film containing Kr reduces current leakage and improves breakdown characteristics of the insulation film when formed on a (111) surface. Ahn et al. teaches a silicon oxide layer comprising the same material as that of the claimed invention. Therefore, the silicon oxide containing Kr would have inherently performed the same function. Additionally, Claims directed to apparatus must be distinguished from the prior art in terms of structure rather than function. *In re Danly*, 263 F.2d 844, 847, 120 USPQ 528, 531 (CCPA 1959).

“[A]pparatus claims cover what a device is, not what a device does.” *Hewlett-Packard Co. v. Bausch & Lomb Inc.*, 909 F.2d 1464, 1469, 15 USPQ2d 1525, 1528 (Fed. Cir. 1990).

Ahn et al. does not explicitly teach a silicon substrate comprising (111) oriented crystals. Campbell teaches a silicon wafer formed from a boule and having a (111) orientation (Figure 2-23). It would have been obvious to one of ordinary skill in the art to select a commercially available wafer with a (111) orientation since it is commonly used in the art for p-type and n-type wafers.

Ahn et al. does not explicitly teach a device wherein the Kr concentration decreases from a surface of the silicon oxide to an interface between the oxide and the crystal. Ahn et al. teaches forming the silicon oxide by the same method as the claimed invention, which would have resulted in a Kr concentration that decreases from a surface of the silicon oxide to an interface between the oxide and the crystal.

Regarding claims 2, 4, 41 and 43, Ahn et al. does not teach a semiconductor device, wherein the silicon oxide film has a surface state density of $10^{11} \text{eV}^{-2} \text{cm}^{-2}$ or $5 \times 10^{11} \text{cm}^{-2}$. The oxide taught by Ahn et al. would have inherently had the same surface density since the material and process is identical.

Regarding claims 5 and 44, Ahn et al. teaches a semiconductor device further comprising a gate electrode (20) on the silicon oxide film.

Regarding claims 7 and 46, Ahn et al. does not explicitly teach a semiconductor device wherein the crystal surface forms a principle part of the silicon substrate. Campbell teaches a crystal surface that is the principle surface of a silicon substrate. It would have been obvious to one of ordinary skill in the art to incorporate the teaching of Campbell into the device taught by Ahn et al. for reasons discussed above.

Regarding claim 8, Ahn et al. does not teach a semiconductor device, wherein the crystal surface is polysilicon. Campbell teaches a crystal surface comprising polysilicon (Figure 2-21). It would have been obvious to one of ordinary skill in the art to incorporate the teaching of Campbell into the device taught by Jacobs et al. for reasons discussed above.

Art Unit: 2811

5. Claims 6 and 45 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ahn et al. in view of Campbell, pages 29-31 as applied to claim 1 above, and further in view of Campbell, pages 394-396.

Ahn et al. does not teach a semiconductor device, wherein the crystal surface is part of a device isolation groove. Campbell teaches a trench isolation structure that is suitable for integrated circuits with high transistor densities. It would have been obvious to one of ordinary skill in the art to incorporate the teaching of Campbell into the device taught by Jacob et al. since it is desirable to prevent unwanted shorting between active devices on a substrate.

Regarding claim 46, Ahn et al. nor Campbell teach that the crystal surface is formed on a polysilicon film. Polysilicon is a known crystal structure that is commonly used in the art for forming conductive layers and active devices. It would have been obvious to one of ordinary skill in the art to select a known material that is well suited for the intended use.

Response to Arguments

6. Applicant's arguments with respect to claims 1-8 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Douglas W Owens whose telephone number is 703-308-6167. The examiner can normally be reached on Monday-Friday.

Art Unit: 2811

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tom Thomas can be reached on 703-308-2772. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.

A handwritten signature in black ink that reads "Tom Thomas". The signature is written in a cursive style with a horizontal line above the first name.

TOM THOMAS
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2800

DWO